8. *South African Geophilomorpha (Myriopoda).*—By Dr. Karl W. Verhoeff, Pasing, Munich.

(With Plates IX and X.)

Subsequent to Attems's monograph on the Myriopoda of South Africa which appeared in 1929 in the Annals of the South African Museum, the following species of Geophilomorpha have been made known from South Africa :—

Aspidopleres intercalatus Porat.
Mesoschendyla monopora Attems.
,, *caledonica* Attems.
Schendylurus australis Silvestri.
,, *polypus* Attems.
Ballophilus braunsi Silvestri.
Purcellinus robustus Attems.
Geoperingueyia conjungens Attems.
Achilophilus monoporus Attems.
Eurytion dolichocephalus Attems.
,, *trichopus* Attems.
,, *aporopus* Attems.
,, *badiceps* Attems.
,, *dentatus* Attems.
,, *sabulosus* Attems.
Polygonarea kraepelini Silvestri.
,, *oligopus* Attems.
,, *monospathis* Attems.
Brachygonarea apora Attems.
(*Philacroterium cribellatum* Attems)
= *Aphilodon cribellatum* (Att.).
(*Philacroterium pauperum* Attems)
= ♀ of *Aphilodon weberi*.
Aphilodon weberi Silvestri.

To the Director, and to Dr. R. F. Lawrence, formerly Assistant at the South African Museum, Cape Town, I here take the opportunity

of tendering my best thanks for sending me the series of Geophilomorpha from the Cape Province with which this paper deals.

It contains 14 species of which 10 are new to Science, a fact which proves that the extent of the Geophilomorphid fauna of South Africa has by no means as yet been determined. The following is the list of the forms under consideration:—

Polygonarea porosa n. sp.
„ *litoralis* n. sp.
Eurytion dentatus Attems.
„ *lawrencei* n. sp.
„ *trichopus* Attems.
„ *gracillimus* n. sp.
„ *kalaharinus elongatus* n. subsp.
„ *brevis* n. sp.
Achilophilus pachypus n. sp.
Aphilodon weberi Silvestri.
„ *caffrarium* n. sp.
„ *porosum* n. sp.
Mesoschendyla cribrifera n. sp.
Aspidopleres intercalatus Porat.

Of the 22 species given by Attems and the 14 which now lie before me, 4 species are contained in both lists. It must also be taken into account that my investigations have demonstrated that the genus *Philacroterium* erected by Attems is untenable, as it is identical with *Aphilodon*. Attems separated *Philacroterium* with a two-jointed tarsus of the terminal legs from *Aphilodon*, as the latter has only a single-jointed tarsus in the terminal leg. I have been able to show that this dimorphism of the terminal legs is a sexual character, as the male has thickened terminal legs with a single tarsal segment, while the female has slender terminal legs with a normal two-jointed tarsus. *Philacroterium pauperum* Att. must be dropped, as it represents the female of *Aphilodon weberi* Silv., and *P. cribellatum* thus becomes *Aphilodon cribellatum* Att. From this it follows that Attems's list comprises 21 and not 22 species, and with the new forms contributed by myself no less than 31 forms are now known to occur in South Africa.

As my 10 new species are not known from any other countries and of Attems's list only 3 are known from other regions, and those 3 from South West Africa (*Aspidopleres intercalatus*, *Mesoschendyla monopora*, and *Polygonarea kraepelini*), it follows that all

the 31 Geophilomorphid species are endemic in South Africa and 28 of them are known only from the Cape Province and Natal.

The genus *Aphilodon* requires special attention from the viewpoint of comparative morphology. In his work on the Geophilomorpha in "Das Tierreich," Lief. 52, 1929, Attems (on p. 157) makes the *Aphilodontinae* a subfamily of the *Geophilidae*, and says of it: "Trochanteropraefemur und Femur der Kieferfüsse verwachsen, sodass das Telopodit dreigliedrig erscheint." By this character the *Aphilodontinae* can be readily distinguished from all other *Geophilidae*. In contrast to the above statement Attems writes (on p. 12) that the telopodite of the maxillipedes in the *Aphilodontinae* is "sogar nur dreigliedrig, indem Femur und Tibia verschmelzen." He therefore says that one of the segments of the maxillipede has disappeared, in the first place by the fusion of the femur and tibia, and then again by the fusion of trochanteropraefemur and femur, so that there is no basis for either one or other of these hypotheses. Actually there is nothing to be seen in his figures of the maxillipedes of the *Aphilodontinae* to support either view (*e.g.* his fig. 39 on p. 191, in "The Myriopoda of South Africa").

In the circumstances I was determined, with Aphilodontine material before me, not to let slip the opportunity of settling this question. Previously there was, besides the views put forward by Attems, a third possibility, namely, that of the two short intersegments of the maxillipedes, one had become altogether atrophied or suppressed, as can be observed in the Chilopoda in general where successive reductions of both the intersegments can be observed, and in many Geophilids, *e.g.* the subgenus *Onychopogaster* of the genus *Geophilus*, where these intersegments have actually been strongly reduced. My investigations on the maxillipedes of *Aphilodon* soon proved that in this genus there is actually a fusion of femur and trochanteropraefemur, as can be seen from figs. 4 and 8. In *Aphilodon weberi* and *caffrarium* there is a more or less long suture in front of the more basal of the two tubercles which occur on the inner margin of the maxillipede telopodite which I at once recognised as the vestigial traces of an articulation between trochanteropraefemur and femur; this suture extends further above than it does below towards the outer side. If there was still any doubt remaining this would be dispelled by *Aphilodon porosum* (fig. 4), in which species the boundary between trochanteropraefemur and femur has remained almost complete; above and below and just at the outer end (y) a small portion is missing. On the inner side behind the tubercle there is

even a small intersegmental membrane representing the remains of a true articulation.

From this it will be seen that the femur is not always absent in *Aphilodon*, but that it is sometimes reduced to a more or less imperfectly defined terminal portion of the trochanteropraefemur. Thus all the segments of a normal walking leg are recognisable in the maxillipedes of *Aphilodon*, the trochanter being indicated by the well-known "Trochanterkerbe" (tk), which also exhibits an abbreviated marginal suture, while the coalescence of tarsus and ungulum to form a tarsungulum (tau) is denoted by at any rate a difference of chitinisation and pigmentation.

This leads me finally to the conclusion that too much systematic weight has been attributed to the alleged 3-jointed telopodite of the maxillipede, at least when it has been made the basis of family distinctions, as Silvestri has done. The *Aphilodontinae* without doubt constitute a natural group, but seeing that they have lost the labrum and both pairs of maxillae are reduced, their natural relationships are not with the true *Geophilidae* but as a subfamily of the *Scolioplanidae* (*Dignathodontinae*).

I must here refer to an important characteristic of the *Aphilodontinae*, as it has hitherto been quite unknown, viz. the structure of the poison glands of the maxillipede. As is well known, the body of the poison glands in most *Geophilidae* lie on the inner side of the maxillipedes, so that the vesicles of the poison gland are found on the inside of one or two of the segments of the telopodite; in *Achilophilus*, for instance (fig. 10), where four segments of the telopodite are found close together, they are situated at the outer extremity of femur and tibia. In *Achilophilus*, however, there is nothing to be seen of a poison vesicle in the neighbourhood of the maxillipedes. In an unmacerated specimen of *A. caffrarium* I could follow the fine poison canal throughout the whole maxillipede telopodite, and even further backwards in the region of the coxosternum of the maxillipede between muscles. Further along the body, however, the faint outline of the canal could no longer be seen. On the other hand, I have observed the presence of a poison vesicle in the neighbourhood of the 18th leg segment in *Aphilodon porosum*, which was about half the length of the 18th sternite, truncate anteriorly and posteriorly, and about as wide as the trochanter of a leg. I noticed this vesicle only on the one side, on the other it became lost. That it really is a vesicle of the poison glands is proved by its well-known structure, namely, the penetration of the walls of the vesicle by large numbers

of fine close-set pores, by means of which the canals of the individual cells of the gland open.

That the poison glands of the maxillipedes are situated in the body instead of the maxillipedes has hitherto only been observed once in the *Geophilidae*, namely, in the genus *Chaetechelyne*. On this question I wrote in 1902 in my work on Chilopoda (Bronn's Klass. u. Ordn. des Tierreichs, Lief. 63–65, p. 35) the following:—

"A noteworthy exception (from the usual position of the poison glands) is found in the genus *Chaetechelyne* where the glands have left the maxillipede segment and retreated to the 12th to 18th segment of the body (Duboscq)."

This exception in the case of *Chaetechelyne* is of all the more interest as this genus belongs to the *Scolioplanidae*, and thus both the exceptions with regard to the maxillipedes belong to the same family, a position which is therefore in accord with my previously stated views on the systematic status of the *Aphilodontinae*.

Finally, I should like to observe that the "absence of ventral pores," which as a common character has hitherto united members of the *Aphilodontinae*, and therefore also the absence of glands in the region of the sternites, has been invalidated by my discovery of a species, *Aphilodon porosum*, in which a number of sternites in the posterior part of the body have two large porose areas situated one behind the other (fig. 6).

Gen. Aphilodon Silv.

(= *Aphilodon* ♂ + *Philacroterium* ♀ Attems.)

I have been able to show that *Aphilodon* and *Philacroterium* are generically identical, and, as mentioned above, merely represent different sexes of the same form in the case of *weberi* Silv. and also *caffrarium*, while I have only seen the ♀ of *porosum*. Attems has recognised 5 species of *Aphilodon* in the old sense, of which, however, only one, *weberi* Silv., inhabits South Africa, while the four others from South America certainly need re-examination.

The South African species can be distinguished as follows:—

(*a*) The 8 sternites anterior to the terminal segment with a large porose area which is usually divided, one area lying behind the other (fig. 6). Claw of the maxillipede with an inner tooth basally (fig. 4). Coxopleurae of terminal legs with numerous scattered pores (fig. 5). 75 pairs of legs *porosum* n. sp.

(*b*) All sternites entirely without pores. . . . . *c, d.*

(*c*) Claw of maxillipede with a small basal tooth. Coxopleurae of terminal legs with numerous scattered pores. 55–71 pairs of legs?
cribellatum Attems.

(I do not consider this species valid, and regard it as merely representing larger individuals of *weberi* Silv. in which a small tooth is present at the base of maxillipede claw. It is also noteworthy that Attems must have seen a ♂ of his *cribellatum*, as he says, "Terminal legs of ♂ moderately incrassate and densely covered with hairs ventrally." Here either the ♂ possesses an abnormal 2-jointed tarsus of the terminal legs or Attems has been mistaken.)

(*d*) Claw of maxillipede without a tooth (fig. 8) . . . . . *e, f.*

(*e*) Coxopleurae of terminal legs with 5–8 large pores (fig. 9) of which almost all lie opposite the semi-circular sternite and only one is occasionally situated more posteriorly. The femoral tubercle of the maxillipede is well developed, that of the praefemur, on the other hand, rudimentary (fig. 8). Ultimate segment of terminal legs of ♀ only ½–⅓ as long as the penultimate segment. 49–55 pairs of legs . . . *caffrarium* n. sp.

(*f*) Coxopleurae of the terminal segment with numerous pores which are, however, on an average smaller and far more scattered (fig. 7), its more trapeziform sternite broadly truncate posteriorly. The praefemur of the maxillipede with an inner tubercle, but little smaller than that of the femur. Terminal legs of ♀ with the two last segments of equal length. 45–55 pairs of legs . . . . . *weberi* Silv.

Aphilodon porosum n. sp.

(Figs. 4–6.)

♀ from 64 mm. with 75 pairs of legs.

Most of the characters are the same in all species of the genus *Aphilodon* so that I shall give only those of diagnostic value. In the maxillipedes the upper coxal plates are fused posteriorly in the middle, this fusion being reinforced in the middle line by a strong rib enclosing a brown stripe (which is absent in other species with a rib).

Clypeus with close reticulation but *without* bristles (both the other species have them). Instead of a labrum there are two undifferentiated transverse plates divided in the middle by weak reticulation. The fulcra are transverse and anteriorly are elongated outwards and forwards as lobes. The almost triangular basal joints of the antennae overlap each other only slightly in the middle (more markedly in the other species). The maxillipedes, which have already been dealt with above, have four distinctly projecting tubercular teeth on the inner side (fig. 4); at the same time they are longer than in the other species, which is evident from the fact that the trochantero-

praefemur is as long on its outer side as its basal width (in the other species, fig. 8, they are considerably shorter). The maxillipedes are accordingly as long as the head.

On the anterior leg-bearing sternites there is a median strip of reticulation in the posterior and middle thirds, whereas the whole of the anterior third is taken up with reticulation in which the pores appear like islands. Of the porose areas which appear on the 8 sternites anterior to the terminal legs, those on the 5 most posterior sternites are divided into two large rhomboidal areas, the one situated close behind the other (fig. 6); those on the sixth sternite from the end unite to form a single very large area, on the seventh from the end they are again separate, while on the eighth from the end only the posterior area is present, being the same size as that of the following sternite, while the anterior area is reduced to a few pores. From the ninth last sternite anteriorly, there is no trace of pores. Otherwise there are a few pores on the procoxa of almost all the legs, these being most conspicuous in the posterior part of the body in front of the terminal segment.

Terminal legs of the ♀ slender, with scattered, fairly short bristles, the last segment $\frac{3}{5}$–$\frac{3}{4}$ as long as the penultimate, the claws well developed. Sternite of last segment (fig. 5) broadly truncate behind, the pores of the coxopleurae numerous but all confined to the under side, their openings nearly always free, a few being hidden by the sternite.

Locality.—This species, the largest of the genus and with the most numerous segments, is known to me only by a ♀ from Oudebosch, River Zonder End, Cape Province.

Aphilidon caffrarium n. sp.

(Figs. 8 and 9.)

♀, ♂ 28–30 mm. with 49–55 pairs of legs.

To distinguish this species from the closely related *weberi* I here supplement the key given above with the following description:—

On the anterior sternites the reticulation forms a longitudinal strip $\frac{1}{4}$–$\frac{1}{3}$ of their width, which widens only near the anterior margin; the bristles are short and scattered. (In *weberi* the anterior sternites have irregularly disposed reticulation, while the bristles are longer and less numerous.) Most of the pores are situated on the coxopleurae of the terminal segment (fig. 9), being larger than the posterior stigmata, while they are so close together that the distance between

them is often less than the width of the pores themselves (in *weberi*, on the other hand, fig. 7, the largest pores are hardly larger than the posterior stigmata, while they are so dispersed that the distance between them is always much greater than the width of the pores themselves). The claws of the terminal legs are rudimentary and blunt in the ♂ (in *weberi* they are also very small but clearly defined and sharply pointed); the terminal segment in the ♂ is about $1\frac{2}{3}$ as long as wide in both species.

Locality.—This species is found at Hogsback, Amatola Mts., and Grahamstown, both in the Eastern Cape Province.

Aphilodon weberi Silv. is the commonest species of the genus, and seems to be found throughout the greater part of the Cape Province, viz. River Zonder End, Table Mountain (Cape Peninsula), Ladismith, and Leliefontein (Namaqualand).

Gen. Achilophilus Attems.

The genus *Achilophilus* is known only from the Cape Province by a single species *monoporus* Att.

Achilophilus pachypus n. sp.

(Figs. 10 and 11.)

The form before me corresponds so closely with Attems's description that I can confine myself to merely a statement of the diagnostic characters.

monoporus Att.	*pachypus* n. sp.
38 mm. in length, 49–55 pairs of legs. Clypeus anteriorly with area. Head not $\frac{1}{4}$ longer than wide. "Maxillipedes do not reach the frontal margin." Antennae touching at their bases. Telopodite of first maxillae with small external lobes. Clypeus anteriorly with some bristles. Anterior sternites with ill-defined porose areas which tend more and more to move to the sides. Fulcra T-shaped, widening anteriorly. Trochanter of terminal legs as long as wide.	22 mm. in length, 53 pairs of legs. Clypeus entirely without area. Head more than $1\frac{1}{2}$ times as long as wide. Claws of maxillipedes reaching to beyond the head (fig. 10). Antennae not touching. Telopodite of the first maxilla entirely without outer lobes. Clypeus smooth, without bristles anteriorly. Anterior sternites in and posterior to the middle with a few scattered pores. Fulcra bent to form a blunt angle and transversely situated. Trochanter of the terminal legs much wider than long.

As a supplement to the description of *pachypus* I note the following: The claws of the maxillipedes (fig. 10) exceed the head anteriorly, and their bases are situated only a little posterior to the anterior

margin of the head. The sutures of the pleurocoxae run somewhat obliquely. Claws of the maxillipedes with a small basal tooth, the structures otherwise without teeth. The small abbreviated poison vesicles lie on the outer extremity of the two intersegments, and the femur is inserted decidedly obliquely. Labrum atrophied. Coxosternum of the second maxilla with a median suture. The coxopleurae of the terminal segment have a gland on each side (fig. 11), the pore of which lies above the lateral margin of the broad trapezoid sternite, just as in *monoporus*. The coxal parts project below, posteriorly, and on the inner side as a rounded pad, and above this I made out a gland; this also exhibits an inner vesicle, which does not, however, open to the exterior. Whether this gland is as yet undeveloped (like that of *monoporus*) must be decided by further investigation. Some glands without a recognisable opening (fig. 11) are also present in the segments of the telopodite, a condition which I have also observed in some other *Geophilomorpha*, e.g. *Schendylidae*. Anal glands absent. Antennae 3 times as long as the head, with sparse, short hairs, the ultimate segment $2\frac{1}{2}$ times as long as the penultimate one.

Locality.—I have seen only two specimens from Prince Albert, Cape Province.

Gen. Eurytion Attems.

The genus *Eurytion*, of which Attems in his monograph on the Geophilomorpha recognised 13 species, has been hitherto represented in South Africa by 7 species, of which 6 are found in the Cape Province, *kalaharinus* being confined to South West Africa. *Eurytion* is by far the richest in species of the Geophilomorphid genera, a fact confirmed by the series before me which contains 6 forms of *Eurytion*.

The characters used by Attems in his key are for the most part beyond criticism. I have, however, to reconsider his so-called "Aussentaster" of the first maxillae. This expression must certainly be rejected as these structures have absolutely nothing to do with organs of touch (y, fig. 1), but are, on the other hand, very pale and delicate lobes,* and even then as macerated specimens they are often so extremely transparent that one is in great doubt as to their actual nature. Further, on account of their delicacy, the lateral lobes can be easily folded over and in this way overlooked. On these grounds I have in the following key, which includes all South African forms, completely ignored the lateral lobes ("Taster") of the first maxillae.

* The term "Taster" could at most only be applied to the telopodite (t, fig. 1).

Another misleading character is that of the fringes of the labrum, as these are also of a very pale delicate nature, so that in macerated specimens they may be quite indistinguishable. All, or at any rate the majority, of the pores of the coxopleurae of the terminal segment are scattered and have free openings (figs. 20 and 23).

Key to the South African Species of Eurytion.

(*a*) Coxopleurae of the terminal segment entirely without pores, 57–61 pairs of legs . . . . . 1. *aporopus* Attems.

(*b*) Coxopleurae of the terminal legs with scattered pores . . . . *c*, *d*.

(*c*) Trochanteropraefemur of maxillipedes with 2 stout teeth on the inner side *e*, *f*.

(*d*) Trochanteropraefemur of maxillipedes with 1 or without teeth on the inner side *i*, *k*.

(*e*) The pores of the coxopleurae arranged in the form of a horseshoe of which the ventral portion abuts on the lateral margin of the sternite, the dorsal portion being dispersed above, while some pores lying between these two groups are anteriorly situated.* Claws of terminal legs normal. Porose areas of the sternites longish oval. 71–81 pairs of legs 2. *dentatus* Attems.

(*f*) The pores of the coxopleurae dispersed ventrally . . . . . *g*, *h*.

(*g*) Claws of terminal legs unusually small (fig. 19), hardly half as long as the width of the second tarsus. Median piece of the labrum transversely elongate, not toothed (fig. 18). Clypeus with close hexagonal reticulation but no bristles, a rather ill-defined area. 59 pairs of legs 3. *gracillimus* n. sp.

(*h*) Claws of terminal legs normal, thus as long or almost as long as the width of second tarsus (fig. 21).

* The 7–8 pores of the coxopleurae situated in two rows next to the sternite. Porose area of the anterior sternites round. Area of the clypeus longish oval with 3–5 bristles, behind these 2–6 bristles. Median portion of the clypeus almost cordiform, not wider than long. 69–77 pairs of legs . . 4. *sabulosus* Attems.

** The 9-10 pores of the coxopleurae (fig. 20) not all situated close to the sternite, half of them lying more laterally. Porose areas on sternites 2–14 transversely oval. Clypeal area rounded and with a bristle. Median piece of the labrum transversely elongate, more than twice as broad as long. 47 pairs of legs . 5. *brevis* n. sp.

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* Attems's account (*loc. cit.*, p. 261), in which the coxopleurae of *dentatus* "are provided with 2 groups of larger pores, the one consisting of a strip of 7–8 opening beneath the margin of the sternite, the other of 5–6 dorsally beneath the margin of the tergite," is not sufficiently exact and refers to immature individuals.

(*i*) The pores of the anterior sternites form a transverse dispersed strip posterior to the middle of the sternite, and in addition there is a small group of pores on each side anterior to the middle. Trochanteropraefemur of the maxillipedes entirely toothless. Coxopleurae of the terminal segments with 15–16 dispersed ventral and lateral pores. 39–49 pairs of legs
lawrencei n. sp.

(*k*) The pores of the anterior sternites forming a compact rounded to transversely oval area. Clypeus with area . . . . . *l*, *m*.

(*l*) Trochanteropraefemur of the maxillipedes with a tooth or tubercle on the inner side. Anal glands absent . . . . . *n*, *o*.

(*m*) Trochanteropraefemur entirely without a tooth or tubercle . . *p*, *q*.

(*n*) Porose area of the sternite, beginning from the second, transversely oval. Pores of the coxopleurae dispersed over the greater part of the ventral surface almost as far as the posterior margin of the coxae. 71–75 pairs of legs . . . . . 7. *dolichocephalus* Att.

(*o*) Porose area of sternites round to slightly transverse ovate.

* Pores confined to the anterior half of the coxopleurae, not passing beyond a line touching the hind margin of the sternite. Tibia and both the tarsal segments of the terminal legs much slenderer than the preceding segments. Sternite of the terminal segment with its sides convex. Areas of sternites round. 61 pairs of legs
8. *kalaharinus* Att. ♂

** Pores of the coxopleurae opening partly above, partly below; some of them, however, situated posteriorly to a line touching the hind margin of the sternite (fig. 23). Only the two tarsal segments of the terminal legs much slenderer than the remaining segments. Sternite of the terminal segment with straight sides, being thus trapeziform. Areas of sternites slightly transverse ovate. 83–87 pairs of legs . . . 9. *kalaharinus elongatus* n. subsp.

(*p*) The porose areas situated posterior to the middle beginning from the second sternite, entirely round. Coxosternum of first maxillae without lateral lobes. Anal glands absent. Pores of the coxopleurae numerous, ventrally and dorsally. 81–89 pairs of legs . . 10. *badiceps* Attems.

(*q*) The porose areas situated posterior to the middle beginning from the second sternite and bounded anteriorly by an arcuate furrow while posteriorly they form approximately a right angle, thus resembling a quadrants. Coxosternum of the first maxilla with lateral lobes. Anal glands present. Pores of the coxopleurae numerous, ventral and pleural. 65–69 pair. of legs . . . . . 11. *trichopus* Attems.

Eurytion lawrencei n. sp.

(Figs. 16 and 17.)

♀ 24–32 mm., with 39–49 pairs of legs. Antennae with segments 2–5 with 3 whorls of hairs. Labrum with a bluntly triangular

median piece (fig. 17) about as long as wide, and weakly striated posteriorly; I have not observed a fringe on the labrum. Head-plate with sparse bristles; clypeus anteriorly without an area and without bristles, with dense mosaic cell structure; posteriorly, on each side in front of the labrum a smooth window-like area (fe, fig. 17). Coxosternum of the first maxilla without, basal segment of the telopodite with, a short outer lobe; maxillipedes with a small tooth only at its base. Vesicle of poison gland twice as long as wide, situated at the base of the claw. First sternite with 6 pores. The 2–11 anterior sternites on each side with a transverse strip of well-separated pores posterior to the middle, well separated from the sides of the sternites (fig. 16), while anteriorly another small group of pores can be seen on each side; otherwise all these sternal pores are not very noticeable, but in their arrangement they differ from those of all other South African species. On the sternites following, the pores are entirely absent. Two pairs of larger bristles are present on the most anterior and most posterior sternites, while the sternites between them are provided with a few very short bristles.

Sternite of terminal segment trapeziform but arcuate posteriorly. The 14–15 pores of the coxopleurae open freely and are scattered ventrally and at the sides, most of them being as large as the posterior stigmata, but 4 on each side distinctly smaller. Terminal legs of ♀ with a few bristles, the claws stout, the proximal tarsal segment little shorter than the terminal one. Genital sternite with 2 transverse rows of bristles. Anal pores large.

Locality.—This species, named in honour of Dr. R. F. Lawrence, is represented only by a ♀ from River Zonder End, Cape Province.

Eurytion brevis n. sp.

(Figs. 20 and 21.)

Immature example 19–26 mm. in length, with 39–47 pairs of legs. In general most closely resembling *sabulosus* Att., from which it differs in its smaller size, in having fewer pairs of legs, in the more scattered coxopleural pores (fig. 20), in the median piece of the labrum being ½ as wide as the lateral pieces (in *sabulosus* it is hardly ¼ as wide as these), and in the homogeneity of the clypeal reticulation, which contains neither an area nor bristles; furthermore, the porose areas beginning from the second segment are transversely oval. Trochanteropraefemur of the maxillipedes with 2 sharp stout teeth on the inner side, a similar one at the base of the claw, while both

intersegments are smooth; anterior margin of coxosternum with 2 blunt tubercles.

Segments 1–5 of the antennae with 1–2 whorls of hairs (it is doubtful if the first maxillae have lateral lobes). First sternite without pores, the transversely oval porose areas which are distinct up to the thirteenth sternite consist in the second sternite of 3–4 pores in a longitudinal row, 6–7 in a transverse row; fourth sternite similarly with 4 and 10 pores. These areas are situated behind the middle and occupy the middle third of the segment in a transverse direction. The 9–10 coxopleural glands have free openings by means of scattered pores (fig. 20).

Locality.—The specimens before me I take to be half grown, but the species is nevertheless quite distinct from the other known forms. Table Mountain, Cape Town.

Eurytion kalaharinus elongatus n. subsp.

(Figs. 22 and 23.)

♀ 47–56 mm. With 83–87 pairs of legs.

Median piece of the labrum weak (fig. 22), hardly as wide as long, and without noticeable serrations on the hind margin. (In *dolichocephalus* Att., though it is not larger than *elongatus*, the median piece of the labrum is distinctly dentate posteriorly and the lateral pieces have long fringes.) The fringes of the lateral pieces fairly long, but diminishing fairly suddenly mesially. Maxillipedes quite similar to *dolichocephalus*, the claws therefore with a sharp triangular tooth and the trochanteropraefemur with a small blunt inner tooth. Poison vesicles hardly longer than wide, situated on the outer side of the tibia. Clypeus with a large area bearing 2 pores, a few bristles at the sides only. First sternite without pores. From the second sternite onwards there is short transversely oval to round porose area which on sternite 5 is not quite as wide as its distance from the lateral margins. These sternal pores are divided into two fairly large groups in the posterior half of the body, which again converge on the two sternites before the terminal segment. The sternites are practically smooth, large bristles being absent on nearly all of them. The numerous scattered and freely opening pores of the coxopleurae lie partly above and partly below (fig. 23) their sternite trapezoid.

E. dolichocephalus, *kalaharinus*, and *elongatus* are all closely related, and further material will show whether or not their position as given

above is valid. The 4 ♀♀ before me are from Kakamas (Orange River) and Garies (Namaqualand).

Eurytion gracillimus n. sp.

(Figs. 18 and 19.)

Subadult form 28 mm., with 59 pairs of legs.

Trochanteropraefemur of maxillipedes with 2 blunt teeth, claw with a sharp basal tooth, intersegments without teeth, anterior margin of coxosternum with 2 blunt projections bearing a small bristle. Antennal segments 1–5 each with 1–2 whorls of hairs. Median piece of the labrum transverse, not toothed; the whole labrum with extremely weak fringes (fig. 18). First maxilla entirely without lateral lobes. Clypeus with comparatively large hexagonal reticulation, without area and without bristles. Anterior sternites in and posterior to the middle with a very small group of a few ill-defined pores. Body very slender. Only one pore opening freely in the middle of the underside of the coxopleurae of the terminal segment; posterior to this are 1–2 incompletely developed glands without a pore opening. The species is distinguished by the unusually small size of the claws of the terminal legs (fig. 19), both tarsi of which are more slender than the tibia.

Although I have only seen a subadult example of this form, I must regard it as new; even if we disregard the number of the coxal glands, which as we know increase during epimorphosis, it differs from its nearest ally, *E. brevis*, in several respects.

Locality.—Prince Albert, Cape Province.

Eurytion trichopus Attems.

(Figs. 24 and 25.)

♂ 52 mm. with 65 pairs of legs. ♀ 50 mm. with 71 pairs of legs.

The author writes of this species on p. 262 of his monograph, "first maxillae with 2 pairs of '*Aussentastern*' both finely spined, those of the synocoxite short triangular, those of the first telopodite segment longer and slenderer." I have already mentioned the incorrect use of the term "Taster," but the expression "spined" is also misleading, as by spines we mean strong setae or bristles, while actually no bristles are present on these lateral lobes and no nerve fibres enter them, which shows how little morphological meaning this expression has. In actual fact there are on the lateral lobes of all Geophilomorpha

very minute prickles which apparently represent minute chitinous hairs. *E. trichopus* has only short and extremely pale lateral lobes on the first maxilla.

On the coxopleurae there are, according to Attems, "numerous large pores"; his fig. 227 shows these as being of different size, but he does not say whether they also occur dorsally. I therefore state that the pores of the coxopleurae are ventral, pleural, and dorsal in the ♂ and ♀.

The posterior portion of the last sternite and the postero-ventral region of the coxae are so thickly covered with short bristles that the comparatively large sockets of these bristles resemble a porose area. This area of bristles decreases posteriorly throughout the whole of the ventral region in the ♀, in the ♂ it widens on the inner side near the margin of the sternite; in the ♂ the coxopleurae exceed the hind margin of the sternite by ½ their length, in the ♀ by only ¼.

Terminal segment of last legs about ⅔ as long as the penultimate in ♂ and ♀; the sternal porose areas are larger than those shown in Attems's fig. 226, *e.g.* almost twice as wide as their distance from the lateral margins in sternite 6. The first sternite with more than 20 pores in the ♂ and 8 in the ♀. In sternite 22 the area is broader and shorter, and on 23 it begins to divide into two lateral groups.

Locality.—I have identified this species from River Zonder End, and Table Mountain, Cape Town.

Eurytion dentatus seems to be the commonest species of the genus. I have examples from Garies, Leliefontein (Namaqualand); Hout Bay, Smitswinkel Bay (Cape Peninsula); Swellendam; Grahamstown. 71–79 pairs of legs.

Gen. Polygonarea Attems.

Three species have thus far been known of this genus, which is endemic in South Africa. *Eurytion* and *Polygonarea* are extremely similar. I should thus like to indicate that *Polygonarea*, besides the lateral longitudinal grooves of the coxosternum of the second maxilla (which are present in all *Chilenophilenae*), differs further from *Eurytion* in the glands of the coxopleurae of the terminal segment; the pores of these glands are not only larger and on an average fewer in number, but almost all of their openings are hidden. In addition there is a process on the inner side of the second maxillar coxa.

The following is a key to the known species of *Polygonarea*:—

(*a*) The 2–6 antennal joints densely covered with strong bristles which form 4–5 irregular whorls (fig. 15). Middle piece of the labrum distinctly toothed. Anal pores large. Trochanteropraefemur of the maxillipedes with a strong blunt tubercle on the inner sides. Clypeus without bristles. Head-plate anteriorly and anterior to the middle with a reticulated transverse band, between these bands on each side about 15 strong bristles. 51–53 pairs of legs . . . . . *litoralis* n. sp.

(*b*) The 2–6 antennal joints with only 1–2 bristle whorls (fig. 12), or if in joints 2–4 other bristles are present between the two whorls, they are either isolated or very small . . . . . *c*, *d*.

(*c*) The 3–6 antennal joints with only one basal bristle whorl, sternites 2–18 and the 10 last sternites with a median, rounded, porose area, in addition a small group of pores on each side anteriorly. 51–57 pairs of legs *monospathis* Attems.

(*d*) The 3–6 antennal joints with 2 bristle whorls. Most of the sternites with a transverse band of pores posterior to the middle which is more or less interrupted in the middle of the body and divided into two groups, in addition a small group of pores on each side anteriorly . . . *e*, *f*.

(*e*) Middle piece of the labrum smooth, not toothed. Anal pores present. (Clypeus?) Trochanteropraefemur of the maxillipedes with a small, blunt tubercle. First sternite with 2 small pore groups. 61–65 pairs of legs *kraepelini* Silv.

(*f*) Middle piece of the labrum toothed (fig. 13) . . . . . *g*, *h*.

(*g*) Anal pores present. Trochanteropraefemur of the maxillipedes on the inner side entirely without a tubercle. First sternite with a transverse band of scattered pores. Clypeus with a dense mosaic reticulation, unspined except in the rounded area, head-plate anterior and posterior to the middle with a transverse band of reticulation, between these 2–3 long bristles laterally. Claws of the second maxilla $\frac{2}{3}$–$\frac{3}{3}$ as long as the inner side of the middle joint of the telopodite. 51–59 pairs of legs . *porosa* n. sp.

(*h*) Analdrüsen fehlen, Trochanteropraefemur der Kieferfüsse innen mit stumpfem Häcker . . . . . *i*, *k*.

(*i*) Sternite 1 with 2 small pore groups, clypeus with a rounded area without bristles posterior to it. Coxae of the second maxillae with a process on their inner side which reaches the middle of the praefemur (as in *porosa*) not longer than basally broad. Claws as long as the inner side of the middle joint of the telopodite . . 5. *porosa nodulifera* n. subsp.

(*k*) Sternite 1 without porose area. Clypeus with a transversely oval area and posterior to it a transverse row of 4–6 bristles. Coxae of the second maxillae with an inner process which reaches the inner apex of the prefemur (or a very little below it) and is longer than basally broad. Claws of second maxillae only half as long as the inner side of the middle joint of the telopodite. 51–51 pairs of legs . . . *oligopus* Attems.

The three forms *porosa*, *porosa nodulifera*, and *oligopus* are perhaps all races of one species, a question which must be decided by further investigation.

Polygonarea litoralis n. sp.

(Fig. 15.)

♀ 34–48 mm., with 51 or 53 pairs of legs.

This species can be distinguished from all others by the short and dense bristles of the head-plate and antennae (fig. 15).

Clypeus with dense reticulation but entirely without bristles, the area also only with fine punctuations. Middle piece of the labrum weakly toothed. Maxillipedes with a stout tubercle on trochantero-praefemur, a pointed tooth at the base of the claws. The porose areas of the sternites resemble those of most other species in having posteriorly a transverse, in the middle a more or less interrupted zone of pores, and anteriorly behind the anterior angles two rounded groups. Anterior sternites with extremely short weak bristles. Legs partly clothed with long bristles, the terminal legs of the ♀ with its last segment little shorter than the penultimate one, with stout claws which are, however, exceeded by 4 long bristles. Anal glands present.

Locality.—Only the ♀ of this species is known from Hout Bay, Cape Peninsula, and from Keurbooms River near Knysna.

Polygonarea porosa n. sp.

(Figs. 12–14.)

♀ and ♂ 29–52 mm., with 51–59 pairs of legs.

Process on the inner side of the coxae of the second maxillae at most reaching the middle of the praefemur. Sternite I on each side with a small transverse porose area. Coxopleurae of the terminal legs with 4–8 large concealed pores on each side. Anal glands present.

Attems portrays in his fig. 267 of *P. monospathis* a projecting lobe densely covered with short fine hairs on the inferior side of the coxae of the terminal legs, which he also gives as a generic character, assuming that it occurs in all species of *Polygonarea*. In the form before me the ♀ and ♂ is provided on the posterior margin of the coxopleurae with a more or less projecting area clothed with short hairs. I have, however, not observed an outwardly projecting lobe. The tooth-like appearance of the outer extremity of the first and second telopodite joints of the second maxilla as shown by Attems in fig. 266 for *P. monospathis* is not present in the forms seen by me.

Locality.—Grahamstown and Hermanus. Perhaps these localities represent two races, as I observed differences in the forms of the

poison sacs. To decide this point, however, more specimens are required.

Polygonarea porosa nodulifera n. subsp.

23–24 mm. 45 or 47 pairs of legs. Claws of the maxillipedes serrated on the inner side. Coxopleurae of terminal legs with 5 + 5 large concealed pores. Other than the characters already given in the key there is little of importance to describe.

Locality.—Hogsback near Alice, Eastern Cape Province.

Gen. Mesoschendyla Attems.

Of the three known forms of *Mesoschendyla* two are found in South Africa and one in Java, so that it is very probable that other species will be found in the intervening regions. The new species is closely related to *monopora* Att., but can be distinguished from it as follows:—

monopora Att.

♀ with 59–69 pairs, ♂ with 57–59 pairs of legs. Anterior margin of the coxosternum of the maxillipedes incised. Coxosternum of first maxillipede without, telopodite with lateral lobes. Claws of the second maxilla serrated. Sternites 2–30 (32) with round to transversely oval porose areas. Ventral surface of body well provided with hairs, dorsal surface almost smooth. Terminal legs well provided with hairs. Terminal joint in the ♂ almost half as long as the penultimate joint. The two joints of the gonopods about equal in length.

cribrifera n. sp.

♀ and ♂ with 55 pairs of legs. Anterior margin of coxosternum of maxillipedes with a median incision. Coxosternum and telopodite of first maxillae with lateral lobes (fig. 1). Claws of the second maxillae below with striated lamellae. Sternites 2–25 usually with a triangular, anteriorly truncated, posteriorly rounded, porose area (fig. 3). Tergites with two intercalary tergites provided with a transverse row of fine hairs. Sternites sparsely covered with fine hairs. Hairs of the terminal legs so minute that they appear almost smooth. Terminal joint of ♂ ♀ as long as the penultimate, comparatively longer than in *monopora*. The basal of the two joints of the gonopods about twice as long as the terminal one in the ♂ (fig. 2).

M. cribrifera n. sp.

(Figs. 1–3.)

♂ and ♀ 34 mm. Body slender and pale.

The teeth of the labrum cannot be counted with precision as they are indistinct in the middle. Antennae with reticulated structure only on the first joint; the fine hairs commence on the first joint,

there being no stouter hairs; the last segment with sensory pits on each side behind the middle. The claws of the second maxillae widening on the inner side into an extremely delicate lamella which appears to have very fine striations (fig. 1). It gives the impression that the minute teeth which form a serrated edge in related species are here fused to form a lamella, as the outer side is smooth and simple. There is a prebasal plate behind the head. The porose areas in sternites 2–25 become progressively less distinct in sternites 20–25 owing to their delicacy. The two isolated pores of the coxopleurae of the terminal legs are situated exactly as figured by Attems in fig. 108 for *M. monopora*, and the sternite has an identical shape. In the joints of the telopodite there are numbers of gland cells without recognisable pores.

Locality. — Kamieskroon, Leliefontein, and Garies, all in Namaqualand.

Gen. Aspidopleres Porat.

Aspidopleres intercalatus Porat.

The ♀♀ before me, 74–84 mm. in length and with 107 pairs of legs, agree very closely with Attems' description of specimens from South West Africa in "Das Tierreich," Lief 52, 1929, p. 115. They were collected at the Aughrabies Falls and Kakamas, both on the Orange River.

Review of the Geographic Distribution of the South African Geophilomorpha.

Up to the present 13 genera are known from South Africa. These can be divided into two groups, the one consisting of endemic genera, the other of genera occurring outside of South Africa as well.

Seven genera can be regarded as endemic, viz. *Achilophilus*, *Aspidopleres*, *Brachygonarea*, *Diphtherogaster*, *Geoperingueyia*, *Polygonarea*, and *Purcellinus*, each of which, with the exception of *Achilophilus* and *Polygonarea*, are represented by a single species.

Of the six remaining genera which are found outside the South African region, *Orphnaeus* (*O. brevilobatus* Newp.) is the only one which is widely distributed (and that only in the Tropics), and is thus without special interest here, seeing, moreover, that *Orphnaeus* is the only genus of the Geophilomorpha appearing in South Africa (including the Transvaal) which does not possess an endemic species in this region. All the other South African species are thus endemic, a proof of the spatial and climatic isolation of South Africa which has endured through vast periods of time.

With regard to *Mesoschendyla*, besides the three species from South Africa, only one is known from Java, which differs so strongly from the others that it may prove on closer investigation to represent another genus. *Aphilodon*, besides South Africa, occurs only in South America. *Schendylurus* is found in South, West, and North Africa and in South America. *Ballophilus* is represented in South and Central Africa as well as in the Indo-Australian region; *Eurytion*, as the genus with the widest distribution, is most strongly represented in South Africa, but two species are found in Chile and three in Australia.

Although we might be inclined to regard the South African fauna as having its closest relationships with that of Central and North Africa, judging from the present land distribution, this is not supported by the distribution of the Geophilomorpha, of which South and Central Africa have only two genera in common, South and North Africa only one. On the other hand, three genera are found both in South Africa and South America, while the similarity between South Africa and the Indo-Malayan region is expressed by having three genera in common. There is therefore an undeniable relationship between the regions of the Southern Hemisphere (South Africa, South America, and Australia), which may be explained by ocean currents, or sunken land masses, or by both.

The Geophilomorpha as animals without a calcareous skeleton can easily float on water, and as at the same time they are well adapted for attaching themselves to objects and for concealment in narrow holes and fissures, it is not improbable that, in spite of the enormous distances between South America, South Africa, and Australia, in the course of long periods of time they were occasionally transported by trees drifting on ocean currents from one of these regions to another.

The North African deserts represent such a formidable barrier that only a single genus, *Schendylurus*, has been able to overcome it. With Europe, Asia, and North America, South Africa has neither a genus nor a species in common (the widespread tropical *Orphnaeus brevilabiatus* excepted).

It is especially remarkable that the *Himantariidae*, though very well represented in North Africa, are completely absent in South Africa. The *Oryidae* are evidence of the very old connection between Africa and South America, as they are practically found in these two continents alone, where they are represented by several genera; these genera are, however, with the exception of *Orphnaeus*, different. In a few cases members of the *Oryidae* have reached India, but with

these exceptions they are absent from Asia, Europe, North America, and the Malayo-Australian region. When all the distributional evidence is taken into consideration, there can be no doubt that the Ethiopian Geophilomorpha are most closely allied to those of South America.

EXPLANATION OF PLATES IX, X.

FIGS.

1–3. *Mesoschendyla cribrifera* n. sp.

1. First and second maxillae, seen from above. p, pore of the maxillary glands on the coxosternum of the second maxilla. × 220
2. Gonopods (gp) and penis of ♂ (p), seen from below. × 220.
3. Sternite of seventh segment. × 125.

4–6. *Aphilodon porosum* n. sp.

4. Telopodite of maxillipede, seen from below. x, boundary between the tarsus and ungulum of the tarsungulum (tau); y, termination of the suture between femur (fe) and praefemur (prf), tk, notch of trochanter. × 125.
5. Sternite, coxopleura, and trochanter of terminal segment, seen from below. × 125.
6. The third sternite from the posterior end of body. × 125.

7. *Aphilodon weberi* Silv. ♀. Sternite, coxopleura, and trochanter of the terminal segment, seen from below. × 125.

8, 9. *Aphilodon caffrarium* n. sp.

8. Telopodite of maxillipede, seen from below. × 125.
9. Sternite, coxopleura, and trochanter of terminal segment in the ♂, seen from below. × 125.
10. Telopodite of maxillipede, seen from below. × 220.
11. Sternite, coxopleura, trochanter, and praefemur of the terminal segment, the glands indicated by dotted lines. × 220.

12–14. *Polygonarea porosa* n. sp.

12. The two basal antennal joints. × 125.
13. Labrum seen from below. × 340.
14. Sternite, coxapleura, and trochanter of the terminal segment; pores of the coxal glands indicated by dotted lines. × 125.

15. *Polygonarea litoralis* n. sp. The two basal antennal joints. × 56.

16, 17. *Eurytion lawrencei* n. sp.

16. Fifth sternite with pore groups. × 125.
17. Labrum (la) and the portion of the clypeus anterior to it with window-like smooth areas (fe). × 125.

18, 19. *Eurytion gracillimus* n. sp.

19. Labrum seen from below. × 220.
19. The two tarsal joints of the terminal leg. × 125.

20, 21. *Eurytion brevis* n. sp. ♀.

20. Sternite and coxopleura of the terminal segment, seen from below. × 125.
21. The two tarsal joints of the terminal legs. × 125.

22, 23. *Eurytion kalaharinus elongatus* n. subsp.

22. Labrum seen from below. × 220.

23. Sternite and coxopleura of terminal segment, seen from below. × 125; below and at the side, the receptacula of two coxal glands. × 220.

24, 25. *Eurytion trichopus* Att.

24. Labrum seen from below, anterior to it a portion of the cell structure of the clypeus. × 340.

25. Area of the clypeus with a portion of the cell structure. × 340.